*International Civil Aviation Organization*

**THE TENTH MEETING OF THE SOUTH EAST ASIA AND BAY OF BENGAL SUB-REGIONAL ADS-B IMPLEMENTATION WORKING GROUP (SEA/BOB ADS-B WG/10)**

Singapore, 11 - 13 November 2014

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**Agenda Item 3:** **Review implementation and co-ordination activities and sub-regional implementation plans**

3.7) Review outcome of Ad-hoc Working Group at previous meetings

# OUTCOME OF THE NINTH MEETING OF SOUTH-EAST ASIA BAY OF BENGAL SUB-REGIONAL ADS-B IMPLEMENTATION WORKING GROUP (SEA/BOB ADS-B WG/9)

(Presented by Secretariat)

**SUMMARY**

This paper reviews the outcome of the Ninth Meeting of the South-East Asia and Bay of Bengal Sub-regional ADS-B Implementation Working Group.

## 1. INTRODUCTION

1.1 APANPIRG/18 in 2007 agreed to establish a South-East Asia sub-regional ADS-B implementation working group (SEA ADS-B WG) and adopted Conclusion 18/38.

1.2 The following meetings of the WG have been held:

- SEA ADS-B WG/1 15-16 November 2007 in Singapore
- SEA ADS-B WG/2 27-29 February 2008 in Bali, Indonesia
- SEA ADS-B WG/3 2-3 July 2008 in Putrajaya, Malaysia
- SEA ADS-B WG/4 9-10 February 2009 in Melbourne, Australia
- SEA ADS-B WG/5 21-22 January 2010 in Jakarta, Indonesia
- SEA ADS-B WG/6 24-25 February 2011 in Singapore
- SEA/BOB ADS-B WG/7 28-30 November 2011 in Chennai, India
- SEA/BOB ADS-B WG/8 5-7 December 2012 in Yangon, Myanmar
- SEA/BOB ADS-B WG/9 30 Oct. - 1 Nov. 2013 in Beijing, China
- SEA/BOB ADS-B WG/10 2-13 November 2014 in Singapore

1.3 The SEA/BOB ADS-B WG/9 meeting was attended by 39 participants from Australia, Bangladesh, China, Hong Kong China, India, Indonesia, Malaysia, Maldives, Singapore, Thailand, Viet Nam, IATA and CANSO.

1.4 The whole report of the meeting is available on the ICAO APAC website: http://www.icao.int/APAC/Meetings/Pages/2013-SEABOB-ADSB-WG9.aspx

## 2. DISCUSSION

2.1 The SEA/BOB ADS-B WG/9 meeting reviewed the outcome of AN Conf/12 and APANPIRG/24 on ADS-B related discussions.

**Review of sub-regional implementation plans based on discussions at SEA/BOB ADS-B WG/9 meeting as follows:**

**User Perspective on ADS-B Mandates in the South China Sea (WP/5 to ADS-B WG/9)**

2.2 On 12 Dec 2013 ADS-B OUT Mandates will become effective on certain routes in the South China Sea. Current information from States concerned shows the following Routes will be affected:

| | |
|---|---|
| Singapore: | L642, M771, N891, M753, L644 & N892 |
| Vietnam: | L625, M771, N892, L642, M765, M768, N500 and L628 |
| Hong Kong China: | L642 & M771 |

2.3 Few questions raised in the paper include harmonization of mandates, service delivery outcomes and aircraft handling processes, co-ordination of routes affected which were also discussed by the meeting under Agenda Item 4.

2.4 The meeting discussed about handling of aircraft with ADS-B “inop” failure in flight and considered it should has no difference for transponder failure. The meeting considered that the procedure for handling such failure should be similar to SSR transponder. In case of failure when not departed yet, it should follow maintenance and MEL procedure.

2.5 During a flight, a cockpit warning may be generated because of abnormal function of GPS sensor/receiver.

2.6 DO260 and DO260A equipment do NOT normally generate any warning to the air crew on ADS-B failure. In such cases failure is only detected by ATC either on-ground (ASMGCS system) or in the air.

2.7 Therefore, the crew may be aware of some kinds of failure and won’t be aware of other failures of ADS-B transmitting equipment or ADS-B transmitting incorrect data or failure. Air traffic controllers may be aware some abnormal situation and instruct Pilot to change to standby transponder similar to the procedure for SSR transponder failure. It is collaborative responsibility between pilots and controllers.

2.8 It was advised that States should define plans for handling aircraft with inoperative ADS-B equipment in the circumstances of failure in flight, or for relocation to a maintenance base for rectification.

**ADS-B Collaboration Initiatives (WP/6 to ADS-B WG/9)**

2.9 CANSO highlighted the importance of close collaboration in ADS-B implementation and the need to maintain the momentum of on-going ADS-B initiatives over the South China Sea and Bay of Bengal.

2.10 Many States in the Asia/Pacific Region had implemented or planned to implement ADS-B, but there was a need for greater collaboration among neighbors to harmonize implementation plans. While ADS-B could bridge surveillance gaps and support future ATM concepts, close cooperation was the key to unlocking its full potential. The initial phase of ADS-B implementation over the South China Sea involving Indonesia, Singapore and Viet Nam was a great example of what can be achieved.

2.11 The possibility of ADS-B collaboration between India, Maldives and Sri Lanka had also been proposed, but no meeting between the parties had taken place. CANSO encouraged States concerned in the Bay of Bengal and eastern part of South China Sea to progress ADS-B data sharing in order to achieve more fruitful result of ADS-B Implementation.

**Systematic Performance Monitoring of ADS-B Equipped Aircraft (WP10 to WG/9)**

2.12 Hong Kong China recapped to the meeting that during the ADS-B SITF/12, a working paper was presented regarding a systematic algorithm based on an independent surveillance source and flight plan information to monitor and analyse avionics performance of ADS-B equipped aircraft. Moreover, APANPIRG/24 requested the ICAO Secretariat to seek the possibility of establishing a centralized database for sharing the monitoring results at the ICAO Regional Sub-office.

2.13 The Information in the working paper highlighted the analysis ADS-B data collected within the Hong Kong FIR during the 9 months from December 2012 to August 2013.

2.14 The analysis compared radar and flight plan information with ADS-B reported position, and examined the Navigation Uncertainty Category (NUC) and Flight Identification (FLTID) included in ADS-B reports, concluding that (a) ADS-B reported position deviation of greater than 1NM, (b) NUC of less than 4, and (c) FLTID mismatches against the ATS flight plan were examined if they were present in more than 5% of total reports by the aircraft. The system generated a list of aircraft meeting any of these criteria, including date/time of occurrence, ICAO Aircraft Address, a screen capture of radar and ADS-B tracks, graphical representation of NUC value changes and ADS-B/Radar track deviation. The monitoring and analysis of more than 350,000 ADS-B movements by more than 4,000 ADS-B equipped aircraft identified 3 major categories of problems:

- Category 1: ADS-B position report with good integrity (NUC 4 or greater), but position data bad when compared with radar;
- Category 2: FLTID not matching with Aircraft Identification in the flight plan; and
- Category 3: ADS-B position report with no integrity (NUC always 0)

2.15 Hong Kong China emphasized the safety implications to ATC for Category 1 problem, and recommended that monitoring results for Category 1 aircraft should be shared with other States capable of performing ADS-B monitoring and analysis to verify the findings, and that once verified a list should be promulgated on a central database for sharing with all parties. Concerned States and operators should then take remedial action, with ANSPs considering "blacklisting" affected aircraft from their ground systems before the problems were rectified.

2.16 Category 2 problems were observed for 15,598 (4.4%) ADS-B flights. Category 2 problem would trigger misleading conflict alert to ATC with cluttered screens - two target labels with different IDs (one for radar and another for ADS-B) being displayed to ATC, Hong Kong China recommended that these results should also be promulgated to concerned CAAs to follow up airworthiness issue with operators in question urging them for early rectification. Category 3 problems were observed for 16,612 (4.6%) ADS-B flights. It is recommended that concerned operators should initiate prompt action for rectification, otherwise they will be treated as non-equipped and requested to fly outside ADS-B airspace.

**GPS Avionics Failure**

2.17 Australia provided information at WG meeting discussing the ADS-B impact of GPS avionics failure in Boeing aircraft. The ADS-B architecture of Boeing aircraft included 2 GPS receivers.

2.17.1 Prior to deployment of RTCA-DO260B avionics there was no annunciation to the flight crew of ADS-B failure, and no indication if the transponder failed to receive GPS positional data.

2.17.2 In the event of failure of one GPS unit in Airbus aircraft the other GPS provided information to both transponders. In future Airbus was expected to adopt architecture similar to Boeing to reduce latency.

2.17.3 In the Boeing aircraft configuration the failure of one GPS would result in no ADS-B data being received by ATC if the corresponding transponder was selected as the operational transponder.

2.17.4 In mitigation it would be desirable that Boeing procedures required selection of the transponder on the alternate side if failure of a GPS unit was known by the crew.

2.17.5 As a further mitigation, ATC procedures could be developed, requiring ATC to request that the flight crew selected the alternate transponder when an ADS-B anomaly was detected. Australia had been using this procedure for some years, as detailed in the National ATS Procedures Manual (NAPM):

**9-50-3**
**ADS-B position symbol not displayed**

When ADS-B transmissions from a known ADS-B equipped aircraft are not being received within ADS-B coverage:

a) inform aircraft that ADS-B transmissions are not being received;

b) request pilot change to second transponder if possible; and

c) submit an Event Report.

Australia AIP defined the phraseology SELECT SECONDARY TRANSPONDER

2.17.6 The procedure provided a recovery in cases of failed GPS, and had been successful in recovery from various other ADS-B anomalies.

Centralized Database for ADS-B Avionics Performance Monitoring

2.18 ICAO assistance in the establishment of a centralized database for storing and promulgating monitoring and analysis results for enhanced aviation safety of the region was requested. The Secretariat informed the meeting that the answer is affirmative. RSO agreed in principle to support the requirement and provided the service. However, detailed requirement and specification for the database needs to be developed, access and security procedure for input information and collected data sharing is also need to be further defined. Hong Kong China with support from Australia and Singapore agreed to develop the detailed requirement and procedure for consideration by the ADS-B SITF in April 2014.

2.18.1 Since December 2013, when ADS-B mandates for some major traffic flows in certain airspace over the South China Sea had become effective, monitoring and analysis of avionics performance of ADS-B equipped aircraft had become a significant task for concerned States/Administrations. Problems detected/observed by performance monitoring could have safety implications, which required timely promulgation and rectification.

2.18.2 APANPIRG/24 requested and ICAO agreed to support establishing a centralized database to be hosted by the ICAO Regional Sub-office (RSO) for sharing the monitoring results in order to enhance safety for the Region.

2.18.3 The ADS-B Avionics Problem Reporting Database (APRD) was proposed to be established for the Region and hosted centrally by the ICAO RSO. The proposed database structure is provided at Appendix I (focus Table 1b**)** to ADS-B SITF/13 meeting report.

2.18.3 The APRD would be posted on a secure web-site accessible to States and Administrations, who would nominate a single point of contact for registration with the ICAO RSO. Points of contact would be notified each time the APRD was updated. The site would be administered by the ICAO RSO, and each registered State or Administration would be granted read-only, password protected access rights. A few States and/or Administrations with capabilities to monitor and analyze ADS-B avionics performance would also be accorded Administrator access rights.

2.18.4 States and Administrations were encouraged to establish a mechanism within their ANSP and regulatory authority to perform monitoring and analysis of ADS-B equipped aircraft. Guidance in establishing such mechanisms was provided in the ADS-B Implementation and Operations Guidance Document (AIGD), available on the ICAO Asia/Pacific Regional Office Website at http://www.icao.int/APAC/Documents/edocs/cns/ADSB_AIGD7.pdf

2.18.5 The meeting discussed about a procedure that may be applied for restricted access to the database. After some further discussion, the meeting agreed that a de-identified database of known generic problems would be maintained (Table 1b).

**Review of outcome of South East Asia (SEA) and Bay of Bengal (BOB) Sub-regional Projects**

2.19 The meeting reviewed the updates of the Sub-regional ADS-B implementation projects as presented by the Ad Hoc working groups (South East Asia, Bay of Bengal, East Asia and Regulatory Group) based on the outcome of previous meetings of the SEA/BOB WG/9. The outcome of discussions by Ad Hoc working groups is provided in Appendix **K** to this Report which could serve as a basis for further development of the sub-regional implementation plans at its next meeting. A readiness checklist developed by the SEA/BOB WG/9 meeting is provided in **Appendix L** to the ADS-B SITF/13 meeting Report.

2.21 The meeting is also invited to update ADS-B Implementation status as provided in the **Appendix S** to the CNS SG/18 Report**.**

## 3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) refresh relevant issues progressed by the SEA/BOB ADS-B WG/9 and ADS-B SITF/13 meetings;

b) review the outcome of Ad Hoc Groups meeting at ADS-B SITF/13 meeting as provided in **Appendices K**;

c) update the readiness checklist developed by the SEA/BOB WG/9 meeting as provided in **Appendix L** to the ADS-B SITF/13 meeting Report.

d) updated the implementation status as contained in **Appendix S** to the CNS SG/18 report.

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# REPORT FROM SOUTHEAST ASIA AD HOC WORKING GROUP

*(Hong Kong, China, 25 April 2014)*

**States/Administrations Presented:**

Australia
Hong Kong, China
Indonesia
The Philippines
Singapore
Vietnam
IBAC (As observer)

**Previously Identified Projects**

The South East Asia Group provide an update on the near term implementation of the following projects that were identified in the last task force meeting.

**Project 1 – ADS-B Data Sharing Between Australia and Indonesia**

Phase 1a

Indonesia and Australia sharing data from the following stations:

- Saumlaki ADS-B (Indonesia) (Installed)
- Merauke ADS-B (Indonesia) (Installed)
- Waingapu ADS-B (Indonesia) (Installed)
- Kintamani - Bali (Indonesia) (Installed)
- Thursday Island ADS-B (Australia) (Installed)
- Gove ADS-B (Australia) (Installed)
- Broome ADS-B (Australia) (Installed)
- Doongan ADS-B (Australia) (Installed)

Data Sharing Agreement signed in Nov 2010;

Initial Benefits
Data used for air situational awareness and safety nets.
Enhanced Safety at FIR boundary.
Operational service commenced by Australia in Feb 2011;
Indonesia will publish their ADS-B mandate by 2013 to be effective after 2016.

Phase 1b (Timeline to be decided)

Indonesia and Australia plan to share data from the following stations:

- Bayu Udan ADS-B (Australia) (Location to be decided)
- Cilacap (Indonesia) (Installed)

**Project 2 – ADS-B Data Sharing In South China Sea.**

Phase 1
Under the near term implementation plan, China, Hong Kong China, Indonesia, Singapore and Vietnam would share the ADS-B data from the following stations:

- Singapore ADS-B (Singapore provide data to Indonesia) (Installed)
- Natuna ADS-B (Indonesia provide data to Singapore) (Installed)
- Matak ADS-B (Indonesia provide data to Singapore) (Installed)
- Con Son ADS-B (Viet Nam provide data to Singapore) (Installed)
- Sanya ADS-B (China provide data to Hong Kong China) (Installed)
- Three more Sanya ADS-B (China provide data to Hong Kong China) (To be installed by end 2013)

VHF radio communication services (DCPC) would be provided from the following stations to Singapore and Hong Kong China. This is to enable implementation of radar-like separations in the non-radar areas within the Singapore FIR as well as routes L642 and M771.

- Natuna VHF (Install for Singapore by Indonesia) (Installed and under testing)
- Matak VHF (Install for Singapore by Indonesia) (Installed and under testing)
- Con Son VHF (Install for Singapore by Viet Nam) (Installed)
- Sanya VHF (Install for Hong Kong China by China) (Installed)

ADS-B Data sharing and DCPC services agreement between Singapore and Indonesia signed in Dec 2010.
ADS-B Data sharing and DCPC services agreement between Singapore and Vietnam signed in Nov 2011.
DCPC services agreement between China and Hong Kong China signed in 2005.
ADS-B Data sharing agreement between China and Hong Kong China in progress.

Operational Status
Singapore agreed on separation minima with Vietnam and have commenced on ADS-B operations.

Hong Kong is working with China (Sanya) to agree on the separation minima. The earliest date for the separation reduction from 50nm to surveillance based is tentatively in 3rd quarter 2015.

All 4 states (China, Hong Kong, Singapore, Vietnam) agreed that there is no need for harmonisation for the operational approval.

Initial Benefits
The above sharing arrangement will benefit L642, M771, N891, M753 and L644. Enhanced safety and reduced separation may be applied. Mandate will be effective in 2013.

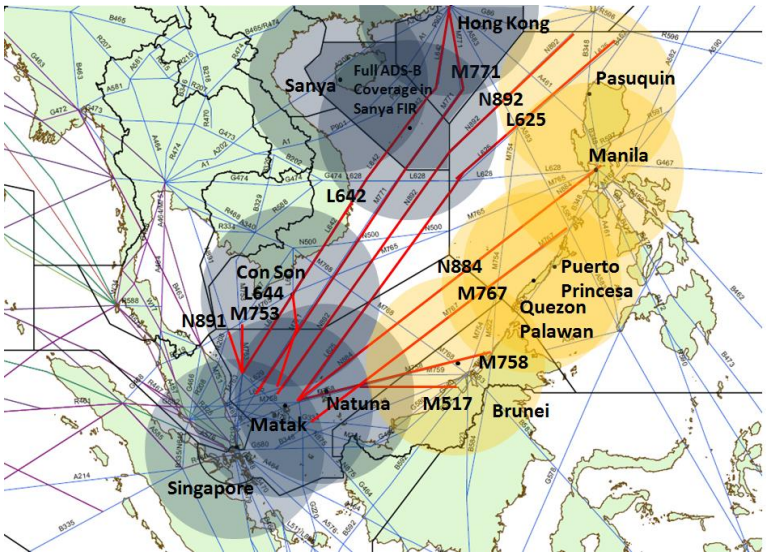
Phase 2
The Philippines CNS ATM project (under the review by Department of Transportation and Communication) includes Manila ADS-B stations.

Singapore signed an MOU with the Philippines to share ADS-B data from Quezon Palawan.

The Brunei CNS ATM project includes ADS-B stations. The locations of the stations are yet to be determined. Tentative location would be an oil rig 20NM North of Brunei. The meeting encouraged Brunei to share the ADS-B data and VHF facilities with Singapore to cover N884, M767, M758 and L517. Brunei in-principle agreed to share ADS-B data and provide the VHF facilities for Singapore.

China will install three more ADS-B stations in Sanya FIR. The additional ADS-B stations may be available for sharing with the Philippines to benefit N892 and L625.

Phase 3
The group will futher explore other possibilities to cover the Southern part of L625 and N892 in future discussions.




**Project 3 – ADS-B data sharing between Indonesia and Malaysia**

Indonesia is willing to share the ADS-B data from the following stations:

- Aceh ADS-B (installed) - to help cover Kuala Lumpur FIR
- Tarakan ADS-B (installed) - to help cover Kota Kinabalu FIR
- Pontianak ADS-B (installed) - to help cover Kota Kinabalu FIR.

The project is still under discussion between Malaysia and Indonesia.

Initial benefits
Enhanced Safety at FIR boundary

Malaysia currently has 1 ADS-B station at Terrengganu. Malaysia plans to install more ADS-B stations before 2020. The stations may be shared in future.

**Project 4 – ADS-B data sharing between Cambodia, Thailand and Viet Nam**

Cambodia is willing to share the ADS-B data from the following stations:

- Phnom Penh International Airport ADS-B (installed)
- Siem Reap International Airport ADS-B (installed)
- Stung Treng City ADS-B (installed)

Vietnam is planning to install stations in the south of HCM FIR from 2015 to 2016. Vietnam is willing to share with Cambodia and Thailand.

Discussions between the three States are on-going.

Initial benefits
For redundancy

**Project 5 – ADS-B data sharing between Indonesia and the Philippines**

Indonesia is willing to share the ADS-B data from the following stations:

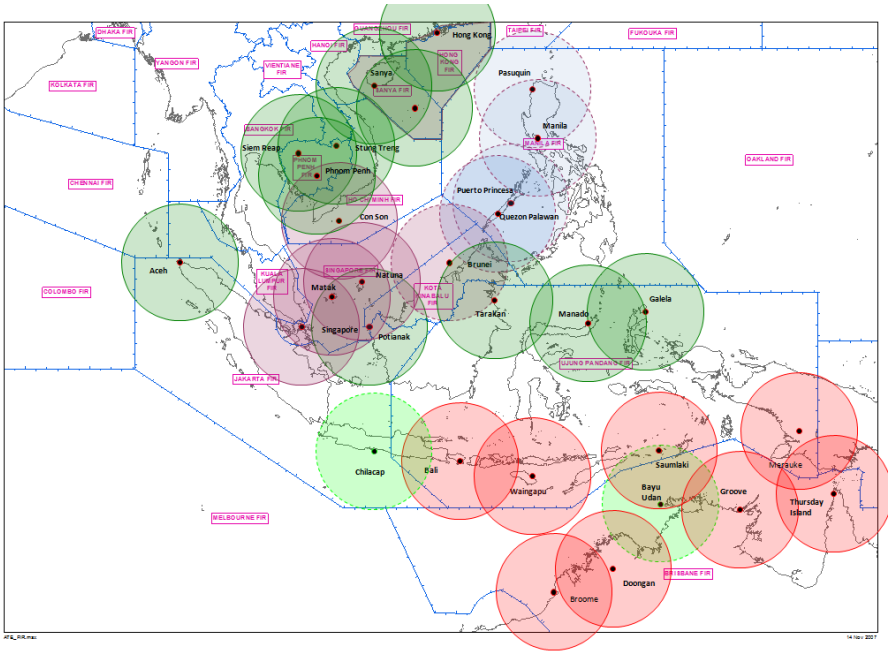
- Manado ADS-B (installed)
- Galela ADS-B (installed)
- Tarakan ADS-B (installed)

Where possible, Indonesia would like to receive ADS-B data from the Philippines from ADS-B stations near the Manila FIR – Ujung Pandang FIR boundary

Currently, the Philippines has no plans to install ADS-B stations at the Southern part of Manila FIR.

The project is still under discussion between Indonesia and the Philippines.

Initial benefits
Situational awareness




## Project 6 – ADS-B data sharing between Australia, Indonesia and Papua New Guinea

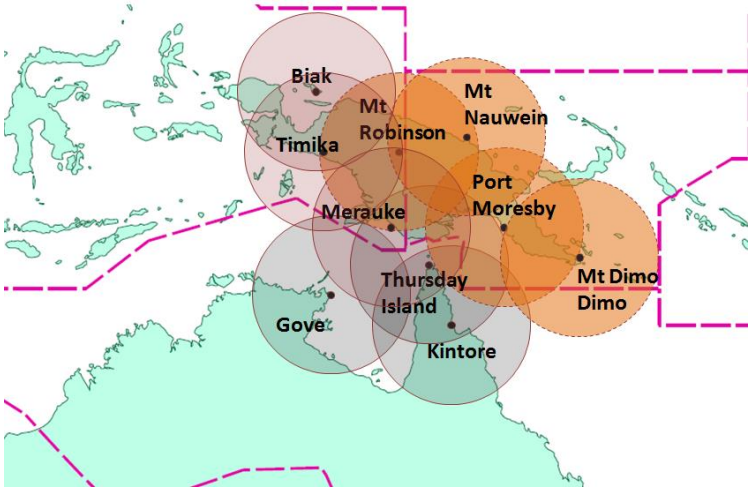
**Data Sharing between Australia and Papua New Guinea**

- Thursday Island (Australia) (installed)
- Gove (Australia) (installed)
- Kintore (Australia) (installed)
- Burns Peak – Port Moresby (PNG)
- Mt Dimo Dimo (PNG)
- Mt Robinson (PNG)

**Data Sharing between Indonesia and Papua New Guinea**

- Burns Peak (PNG)
- Mt Nauwein (PNG)
- Mt Robinson (PNG)
- Merauke (Indonesia) (installed)
- Timika (Indonesia) (installed)
- Biak (Indonesia) (installed)

The project is still under discussion between Australia, Indonesia and Papua New Guinea.


Biak
Mt
Robinson
Mt
Nauwein
Timika
Port
Moresby
Merauke
Thursday
Island
Mt Dimo
Dimo
Gove
Kintore

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| Harmonization Plan for L642 and M771 | | | |
|---|---|---|---|
| **No.** | **What to harmonize** | **What was agreed** | **Issue / what needs to be further discussed** |
| 1 | Mandate Effective | SG, HK, VN: 12 Dec 2013<br>CN: (to be confirmed). | |
| 2 | ATC Operating Procedures | No need to harmonize | Refer to SEACG for consideration of the impact of expanding ADS-B surveillance on ATC Operating Procedures including Large Scale Weather procedures. |
| 3 | Mandate Publish Date | No need to harmonize | To publish equipment requirements as early as possible. |
| 4 | Date of Operational Approval | No need to harmonize | States to remind airlines that operational approval from State of registry is required. |
| 5 | Flight Level | SG, HK, VN, CN:<br>- At or Above FL290 (ADS-B airspace)<br>- Below FL290 (Non-ADS-B airspace)<br><br>SG: AIC issued 28 Dec 2010, AIP Sup issued 6 Nov 13<br><br>VN: AIP Sup issued 31 Oct 13<br><br>HK: AIC issued 24 May 2011, AIP Sup issued 29 Oct 13 | CN (need to be confirmed) |
| 6 | Avionics Standard (CASA/AMC2024) | SG - CASA or AMC2024 or FAA (ES)<br>HK - CASA or AMC2024 or FAA (ES)<br>VN - CASA or AMC2024 or FAA (ES)<br>CN (TBC) | ADS-B Task Force agreed that DO260B will be accepted as well.<br><br>States should include supplement to include the FAA standard.<br><br>Status for CN to be confirmed.<br><br>Indonesia will consider and |

| | | | |
|---|---|---|---|
| | | SG, HK and VN confirmed that their ADS-B GS can accept DO260, DO260A and DO260B. | have a willingness to upgrade their stations shared with other States. |
| 7 | Aircraft Approval | | |
| 7a) | Procedures if Aircraft Not Approved or Aircraft without a Serviceable ADS-B Transmitting Equipment before Flight | SG: FL280 and below.<br><br>HK, CN, VN: Dependent on situation. ADS-B equipped aircraft will be given priority to operate above FL280. | |
| 7b) | Aircraft Approved but Transmitting Bad Data (Blacklisted Aircraft) | For known aircraft, treat as non ADS-B aircraft. (China, Hong Kong - China and Singapore) | Share blacklisted aircraft among concerned States/Administration.(Hong Kong China, Singapore and Vietnam)<br><br>China to be confirmed. |
| 8 | Contingency Plan | | |
| 8a) | Systemic Failure such as Ground System / GPS Failure | Revert back to current procedure. | |
| 8b) | Avionics Failure or Approved Aircraft Transmitting Bad Data in Flight | Provide other form of separation, subject to bilateral agreement.<br><br>From radar/ADS-B environment to ADS-B only environment, ATC coordination may be able to provide early notification of ADS-B failure. | Address the procedure for aircraft transiting from radar to ADS-B airspace and from ADS-B to ADS-B airspace. |
| 9 | Commonly Agreed Route Spacing | SEACG | Need for commonly agreed minimal in-trail spacing throughout. |

**REPORT FROM BAY OF BENGAL AD HOC WORKING GROUP**

*(Venue and Date: CAD Headquarters, Hong Kong, China, 25 April 2014)*

**States Presented:**

Bangladesh;
India;
Maldives
Nepal
Pakistan
Thailand

Sri Lanka and Myanmar were absent in the meeting.

The participants met to update the status of implementation of ADS-B and possible data sharing between the neighboring States.

1. Bangladesh has planned to install four ADS-B ground stations at Dhaka, Barisal, Saidpur and Coxs Bazaar by 2H2016.

2. India informed that 21 ADS-B ground receivers have already been installed and AIP SUPP has been published to use ADS-B in the provision of ATS surveillance service. The data sharing agreement between India and Myanmar can be signed by 2H2014

3. Maldives has installed and commissioned ADS-B ground stations at three locations. The integration of data to the ATM systems has already been completed. Maldives is willing to share ADS-B data with India and Sri Lanka (Expected date: 2015). Also, Maldives has planned to implement exclusive ADS-B airspace at and above FL290 by 2016

4. Nepal is planning to install ADS-B ground stations in future. New MSSR system is going to install and the project will be completed by 2015. MLAT is under the process for a tender.

5. Pakistan has informed the meeting that most of the Pakistan airspace currently is already under RADAR surveillance; some gaps in the West, Northern mountain regions and some portion in the South and the South-West airspace need to be brought under positive feasibility or surveillance. PCAA considers ADS-B, a potential option to fill up the gaps in radar surveillance and also considers using ADS-B to provide partial back-up to the existing radar. Regarding data sharing neighboring countries will be co-ordinated through PCAA.

6. Thailand informed that a new ATM system with capability of processing ADS-B data is expected to be operational in 2015.

ADS-B DATA SHARING

The following locations for data sharing were agreed upon during the sub-group meeting.

INDIA-BANGLADESH
Agartala and Dhaka (2H2016)

BANGLADESH-MYANMAR
Coxs Bazaar and Sittwe (2H2016)

INDIA – MYANMAR
Agartala – Sittwe (2H2014)
Portblair – Coco Island (2H2014)

INDIA – INDONESIA
Portblair – Aceh (2H2014)

INDIA – MALDIVES
Trivandrum – Kulhudhuffushi (2H2014)

MALDIVES – SRI LANKA
Male' – (TBD)

INDIA – SRI LANKA
Trivandrum - (TBD)

## EAST ASIA AD HOC GROUP (JAPAN AND REPUBLIC OF KOREA

*(Hong Kong, China 25 April 2014)*

Republic of Korea and Japan had discussed and shared the information about the ADS-B implementation status of each country including the ADS-B evaluation system, Multilateration system for airport surface and Wide Area Multilateration system.

ROK and Japan already have radar coverage, the implementation of ADS-B is considered as the future surveillance system.

In this sub-region region, there is no data sharing project at present. But, the group agrees that data-sharing would be benefit efficiency of air traffic control in the region.

## REPORT FROM REGULATORY AD HOC GROUP

*(Hong Kong, China, 25 April 2014)*

***States represented: Australia, Hong Kong China, Indonesia and USA***

Australia described the current "cooperative" approach with operators transmitting incorrect ADS-B or Mode S data. This has proven effective as the local operators and avionics installers become familiar with the testing and set up requirements. Australia provided details of Advisory Circulars listing acceptable transponders and GNSS navigation equipment and technical standards as follows:

http://www.casa.gov.au/wcmswr/_assets/main/rules/1998casr/021/021c45.pdf

AC 21-45 v2.1

AIRWORTHINESS APPROVAL OF AIRBORNE AUTOMATIC DEPENDENT SURVEILLANCE BROADCAST EQUIPMENT

http://www.casa.gov.au/wcmswr/_assets/main/rules/1998casr/021/021c46.pdf

AC 21-46(1)
AIRWORTHINESS APPROVAL OF AVIONICS
EQUIPMENT

http://www.casa.gov.au/wcmswr/_assets/main/rules/1998casr/021/021c36.pdf

AC 21-36(1)

GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) EQUIPMENT:
AIRWORTHINESS GUIDELINES

In addition, Australia also described subject of ATC training at the plenary session.

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**READINESS CHECKLIST TABLE**

| Readiness | AUS | SING | INDO | VIET | CHINA | HK | INDIA | MAL | BAN |
|---|---|---|---|---|---|---|---|---|---|
| ADS-B targets displayed on operational ATC screen? | ✓ | ✓ | ✓ | SEP | ✓ | ○ | ✓ | Nov13 | ✓ |
| Blacklist filtering system & procedures | ✓ | ✓ | ○ | ○ | TBC | ✓ | ○ | ✗ | ✓ |
| Foreign Filter system and Datasharing capability/willingness | ✓ | ✓ | ✓ | ✓ | TBC | ✓ | ✓ | ✗ | ✓ |
| ATC procedures & ATC training 7 ATC manual | ✓ | ✓ | ○ | ✓ | ✓ | ○ | ✓ | ✗ | ✓ |
| Maintenance support contract or arrangements | ✓ | ✓ | ○ | ✓ | TBC | ✓ | ✓ | ✓ | ✓ |
| Maintenance staff training & certification | ✓ | ✓ | ✓ | ✓ | TBC | ○ | ✓ | ✓ | ✓ |
| Mandate & process for ADS-B avionics failure | ✓ | ✓ | ○ | ✓ | ✓ | ✓ | ○ | ✗ | ✓ |
| Extensive publicity about mandate | ✓ | | ○ | ○ | ✗ | ✓ | ○ | ✗ | ✓ |
| Recording, monitoring, analysis and feedback capability? | ✓ | ✓ | ✓ | ✓ | TBC | ✓ | ✓ | ✓ | ✓ |
| Avionics installer community engaged (GA &/or Bizjet) | ✓ | | ○ | ○ | TBC | Biz | ○ | ✗ | NA |
| Contacts in Airlines, A/C Manufacturers, Avionics Co | ✓ | AL | ○ | AL | ○ | ✓ | ✓ | ✓ | A/L |
| Regulator & ATC management of Exemption flights inc state aircraft | ✓ | ✓ | ○ | ○ | ✓ | ✗ | ○ | ✗ | TBD |
| Fitment rate (do NOT include NUC=0 aircraft) | >90% | 75 | NA | 60 | 85 | 85 | 60 | 75 | |
| Remove display if without “operational approval” | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ○ | ✗ | ✗ |
| AIP SUP or AIC | ✓ | ✓ | ○ | ✓ | ✗ | ✓ | soon | ✗ | ✓ |
| Flight ID correction & pilot performance | ✓ | ✓ | ○ | ○ | ✓ | ○ | ✓ | ✗ | ✓ |
| Has State given operational approval to own aircraft | ✗ | ✓ | ✗ will | ✓ | ✓ | ✓ | ✗ will | TBD | ✗ will |
| Airline Flight planning OK | ✓ | ✓ | ○ | ✓ | ○ | ○ | ○ | adhoc | ✓ |

## ADS-B IMPLEMENTATION STATUS IN THE APAC REGION

| State/ Administration | ADS-B Ground Infrastructure and ATC System readiness or Implementation plan | Date of issue/effectiveness date of equipage mandate | Mandated Airspace and/or ATS-routes | Intended separation criteria to be applied | Remarks |
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| | | | | | |
| **AFGHANISTAN** | ADS-B & Multi Lateration system installed. | | | | subject to safety assessment |
| **AUSTRALIA** | A total of 31 ADS-B stations and 28 WAM stations are currently used.<br><br>ATC system readiness since 2004.<br><br>ADS-B data sharing with Indonesia operational since 2/2011.<br><br>ASMGCS using multilateration is operational in Brisbane, Sydney & Melbourne. It is being installed in Perth.<br><br>Additional 15 ADS-B stations from 2014-2016.<br><br>OneSKY replacing current ATM system is estimated for full operational around 2020. | 2009/effective date of mandating in UAP 12/12/2013.<br><br>A forward fit ADS-B mandate also applies from 2/2014 for all IFR aircraft at all flight levels.<br><br>An ADS-B for all IFR aircraft applies from 2/2017. | at/above FL290 UAP from 12/2013 for domestic & foreign aircraft.<br><br>Mandates for additional flight level are considered for 2015 & 2017.<br><br>WAM is operating in Tasmania since 2010 delivery 5 Nm separation service.<br><br>WAM is also operating in Sydney for 3 Nm separation service in TMA and for precision runway monitoring function. | 5 NM<br><br>3 NM SYDWAN | |

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| **BANGLADESH** | Bangladesh has a plan to commission four ADS-B ground stations to be installed at Dhaka, Cox's Bazar, Saidpur and Barisal Airports by 2016.<br>ADS-B data will be integrated with new ATS system at Dhaka. | | | | |
| **CAMBODIA** | 3 ADS-B ground stations have been installed in Cambodia since 2011 and able to provide full surveillance coverage for Phnom Penh FIR. | | | | |
| **CHINA** | 5 UAT ADS-B sites are used for flight training of CAFUC.<br><br>8 ADS-B stations installed by end of 2012. 200 ADS-B stations nationwide will deployed as 1st phase.<br><br>1 ADS-B station operational in Sanya FIR since 2008.<br>Sanya ATC system ready since July 2009 to support L642 | NOTAM issued on ADS-B trial operation | | | ADS-B signal alone won't be used for ATC separation |

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| | nd M771.<br><br>Chengdu-Jiuzhai project finished in 2008 with 2 ADS-B stations and additional site is planned to enhance the surveillance coverage.<br><br>Chengdu - Lhasa route surveillance project completed with 5 ADS-B stations using 1090ES since 2010. Trials planned from May 2011.<br><br>1 ADS-B site installed in Sanya FIR since 2008. 3 additional ground stations planned, Trial planned for Jun, 2011. | | | | |
| **HONG KONG CHINA** | A larger-scale A-SMGCS covering the whole Hong Kong International Airport put into operational use in April 2009. | AIP supplement issued on 29 Oct.2013/12 Dec. 2013 as effective date. | L642/M771 ATS routes. | To be determined. | ADS-B signals being fed to ATC controllers under an operational trial programme.<br><br>ATS automation system to be ready in 2015 |

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| | Data collection/ analysis on aircraft ADS-B equipage in Hong Kong airspace conducted on quarterly basis since 2004.<br><br>ADS-B trial using a dedicated ADS-B system completed in 2007. ADS-B out operations over PBN routes L642 and M771 at or above FL 290 within HK FIR are planned in December 2013 and within HK FIR at or above FL 290 in December 2014.<br><br>ADS-B ground station infrastructure completed in 2013.<br><br>ADS-B trial using ADS-B signal provided by Mainland China to cover southern part of Hong Kong FIR commenced in 2010. | | | | ADS-B planned to be put into operational use 6 months after new ATM System in operation |
| **MACAO, CHINA** | Mode S MSSR coverage available for monitoring purposes. | | | | |

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| **DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA** | ADS-B has been used as back-up surveillance of SSR since 2008. | | | | |
| **FIJI ISLANDS** | ADS- B /multilateration ground stations installed. Situations awareness service will be provided in 2013. | | | | |
| **FRANCE** ***(French Polynesia)*** | Project launched to install 9 ADS-B stations. 2 stations to be installed in 2014; 3 in 2015 and 4 will be installed in 2016. | | | 5 NM for airspace under coverage. | |
| **INDIA** | ASMGCS (SMR + Multilat) is operational at Delhi, Mumbai, Chennai, Kolkata, Bangalore and Hyderabad Airports.<br><br>ASMGCS is also being installed at 05 more international airports.<br><br>ADS-B Ground Stations installed at 14 locations in phase one across continental and Oceanic airspace at Port Blair. 07 more ADS-B | AIP supplement issued on 17th April 2014 with effective date of implementation from 29th May 2014. | | | ADS-B in India to provide redundancy for radar and filling the surveillance gaps.<br><br>Currently study the integrity of ADS-B data and evaluating in both Non-radar and radar environment for ATC purposes. |

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| | Ground stations in phase two in 2014.<br><br>ATS systems at 12 ACCs are capable of processing ADS-B data and provide the information on Display.<br><br>Wide area Multilateration pilot project is being planned in Kolkata TMA to augment the surveillance coverage. | | | | |
| **INDONESIA** | 30 Ground Station successfully installed.<br><br>Since 2009, ATC Automation in MATSC has capabilities to support ADS-B application.<br><br>ADS-B Task Force team established to develop planning and action concerning ADS-B Implementation within Indonesia FIR<br>ADS-B data sharing with Australia and Singapore. | | | | ADS-B Task Force Team is considering a mandate in 2016 |

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| **JAPAN** | Multilateration Systems for surface monitoring have been implemented at seven airports and are being implemented at another one airport.<br><br>PRM (WAM) is planned to be implemented at Narita Airport. (Operation will start in 2014).<br><br>Basic design of en-route WAM system completed in FY2013. Plans to start manufacture in FY2014 and estimated operational in FY2018.<br><br>Plan to evaluate accuracy of ADS-B information and has intension to introduce ADS-B to the oceanic direction. | | | | |
| **MALAYSIA** | Malaysia planned to start mandate ADS-B requirement in KL FIR in 2018 and full implementation of ADS-B service at | Plan to issue mandate with target effective date end of 2018. | | | |

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| | specific routes/exclusive airspace by end of 2020.<br><br>Plan to install two ADS-B stations at Pulau Langkawi and Genting Highland by 2016. Data sharing with neighbouring by mid. 2017. | | | | |
| **MALDIVES** | 4 ADS-B stations installed in Nov. 2012 (2 at Male' Ibrahim Nasir Intl Airport, 1 at Kulhudhuffushi Island in the North and 1 at Fuah Mulah Island in the South to cover 95% of the FIR at/above FL290. Maldives' ADS-B is integrated with the ATM system (in November 2013), and under observation prior to commencing trials.<br><br>Maldives has plan to share ADS-B data with its adjacent FIRs. | | | | Seaplane in Maldives equipped with ADS-B for AOC purpose. These seaplanes have ADS-B IN functions as well. |

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| **MONGOLIA** | Five ADS-B ground stations for combination with SSR will be implemented first quarter of 2013.<br><br>Full coverage for surveillance gaps will be implemented by 2015-2016. | | | | |
| **MYANMAR** | ADS-B ground stations to be installed at Sittwe, Co Co Island by end of 2014 as 1st phase Yango , Lashio and Myeik - 2015 as 2nd phase; Kengteng, Myitkyina in 2016.<br><br>Completion of integration to Euro Cat. C. in 2014.<br><br>Agreed to share ADS-B data with India, agreement on sharing being negotiated. | | | | Supplement radar and fill the gaps to improve safety and efficiency.<br><br>ADS-C/CPDLC integrated in Yangon ACC since 2010. |
| **NEPAL** | ADS-B feasibility study conducted in 2007. | | | | |

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| **NEW CALEDONIA** | Three ADS-B ground stations commissioned in 2010 to cover international traffic at La tontouta airport serving Tontouta ACC & APP. It is used for Situation awareness and SAR. | | | | |
| **NEW ZEALAND** | MLAT being used in Queenstown area (WAM) and Auckland (airport surface movements).<br><br>ADS-B data available from all MLAT & SSR sites.<br><br>New Zealand Navigation and Airspace and Air Navigation Plan "New Southern SKY" issued May 2014 | | | 5 NM Surveillance Separation | |
| **PAKISTAN** | Feasibility study for using ADS-B is in hand. One station was installed at ACC Karachi and evaluation is in progress. | | | | |
| **PAPUA NEW GUINEA** | Legislation mandating ADS-B and guidelines for aircraft equipage and operational approval to be issued by | | | | |

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| | 31/12/2011 with target mandatory date by mid-2015 and plans to provide ADS-B service above FL245 within Port Moresby FIR and also in specific higher traffic areas domestically. | | | | |
| **PHILIPPINES** | One (1) ADS-B ground station in Manila ATM Center will be available in 2016. | | | | |
| **REPUBLIC OF KOREA** | ADS-B implemented 2008 for SMC in Incheon International Airport. ROK is developing ADS-B system since 2010 through R&D group. The testbed at Gimpor Airport supporting both 1090ES and UAT, undergoing operational testing (2013-16). At Incheon Intl Airport, promotion of surface surveillance (2014-17) In 2nd phase from 2015 to 2016, ADS-B ground stations will supplement | | | | |

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| | to the radar in the terminal area and fill up the gap between radar coverage. The last phase from 2017 to 2020, ADS-B will be deployed for entire Incheon FIR. | | | | |
| **SINGAPORE** | The airport MLAT system was installed in 2007 and "far-range" ADS-B sensor was installed in 2009.<br><br>ATC system has been processing ADS-B data since 2013. | AIC was issued on 28 December 2010/effective from 12 December 2013.<br><br>AIP supplement published in Nov 2013 to remind operators of ADS-B exclusive airspace implementation. | L642 and M771.<br><br>At and above FL290. Also affect the following ATS routes N891, M753, L644 & N892 | 40nm on ATS routes L642, L644, M753, M771, N891 and N892<br><br>30nm planned for 26th June 2014 on ATS routes L642, M753, M771 and N892;<br><br>20nm panned for end 2015 | Safety case was completed end of November. 2013. |
| **SRI LANKA** | ADS-B Trials planned for 2012 and implementation in 2013. The ADS-B station was planned at Pidurutalagala. | | | | |
| **THAILAND** | Multilateration implemented in 2006 at Suvarnbhumi Int'l. Airport.<br><br>An ADS-B Ground Station has been installed in Bangkok as test unit. ADS-B is planned to be part of future | | | | |

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| | surveillance infrastructure.<br><br>New ATM System to be in operational in 2015 will be capable of processing ADS-B data. | | | | |
| **TONGA** | Trial planned for 2017 | | | | |
| **UNITED STATES** | As of 31 March 2014, 634 radio sites had been installed; these sites cover the "baseline" set of Service Volumes planned by the FAA in 2007. Since 2007, FAA has planned and funded activities to activate additional Service Volumes that will constitute an additional 29 radio sites.<br><br>Approximately 100 of the 230 U.S. air traffic control facilities are using ADS-B for ATC separation; all facilities are planned to be using ADS-B by 2019. | The U.S. ADS-B Out rule (14 CFR 91.225 and 14 CFR 91.227) was issued in May 2010 and specifies that the ADS-B Out mandate is effective on 1 January 2020. | Class A, B, and C airspace, plus Class E airspace above 10,000 ft MSL. See 14 CFR 91.225 for details. | The U.S. is using both terminal and en route (5nm) separation criteria, depending on the specific airspace and available surveillance information. Terminal separation includes the following separation criteria:<br><br>- 3nm<br><br>- 2.5nm<br><br>- independent parallel approach operations down to 4300 ft centreline separation<br><br>- dependent parallel approach operations down to 2500 ft centreline | |

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| | | | | separation (currently 1.5 nm diagonal distance). | |
| **VIET NAM** | Two phases ADS-B implementation plan adopted. Phase 1 implemented in March 2013. Phase 2 for whole lower and upper airspace of Ha Noi and Ho Chi Minh FIR to be completed by 2016. | AIC issued on 20 June 2013/ADS-B mandating effective from 12 December 2013 in Ho Chi Minh FIR. | M771, L642, L625, N892, M765, M768, N500 and L628 At/above FL290. | | Operators required to have operational approval from State of aircraft registry. |

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